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EDITORIAL NOTES

ENDURANCE AND SERVICE

"I WISH to pay tribute," remarked the Minister of Fuel and Power last week, referring to the services of the public utility undertakings on the South-East Coast during four and a half years of enemy attacks by aircraft, long-range shelling, and flying bombs, "to managements and employees, who at all times and under all conditions have shown a wonderful spirit in facing the hazards of bombs and shells, and in working for very long periods without rest to maintain a service essential to the life of the community." In to-day's "JOURNAL," our penultimate issue of the year 1944, we are able to record the difficulties which four gas undertakings on the South-East Coast—Dover and Deal, Ramsgate and Folkestone—have had to face during this protracted period, difficulties, of course, common to all the public utility undertakings in the area. The story is one of endurance, courage, resource, and cheerfulness. From top to bottom every member of the public services concerned has shown a spirit of service to the public which, we think, marks the general tone of the utility industries and is altogether encouraging. Behind the tale we now unfold on later pages, the disregard of personal safety on the part of the personnel of the public utilities is evident enough; the record is most inspiring.

We confine our account to gas supply during these four and a half years in and around what has so graphically and aptly been described as "Hell Fire Corner"; the part played no less conspicuously by the other public services will doubtless be recorded elsewhere in appropriate detail. It is truly astonishing that in spite of all the enemy could do in the area—and his efforts have in all conscience been concentrated—gas has throughout been supplied to the community practically without fail. When, on occasion, there has been temporary cessation, the break in public service has been measured in a matter of hours. This remarkable achievement has called for devotion to duty of a very high order; it is also, as the undertakings concerned readily and spontaneously admit, the result of co-operation. Without the smooth working of the mutual aid scheme, a scheme admirably conceived, organized, and carried into practical effect, the outcome would have been different and the record less splendid.

Actually it was while visiting Ramsgate Gas-Works in August, 1940, that the "JOURNAL" had this war's bomb baptism—a rude awakening to things to come. Since then until a comparatively few weeks ago, Ramsgate and its neighbours on the South-East Coast have suffered nightmare. Now, battered, scarred, but triumphant, they breathe again. Naturally, to restore normality—we may mention that in Dover not a dwelling has escaped damage of one sort or another—much remains to be done. The task will not be a light one. It will be tackled in the same spirit of resolution which has marked the weary years of bombardment. If the record of these years is one in which legitimate pride may be taken, it also, we suggest, points a very real lesson. It is through co-operation that the difficulties in this period of stress have been successfully surmounted. The times ahead, if not fraught with the same danger, will bring problems the solution of which can be given, not singly, but only through co-operative endeavour. Let us hope that this co-operation will be maintained in both deed and spirit.

The President of
The Institution of Gas Engineers
Mr. S. E. Whitehead, and Mrs. Whitehead,
send to all members of the Institution and to other friends in and connected with the Gas Industry their Cordial Greetings and Best Wishes for Christmas and the New Year

DISTRICT HEATING

DURING the year we have given considerable thought and space to the subject of district heating—a matter which appears to hold much fascination to the minds of many town and city planners, who visualize in the use of steam for the purpose a cheap and altogether rather wonderful service, the while overlooking the complex problems involved and the capital cost entailed. A few months ago we asked to what extent gas did or could enter into the picture, and speaking on very broad lines we suggested that if used in central boilers in individual buildings gas would provide a service comparable with steam district heating if gas was supplied at about 3d. a therm. But we also asked why gas should be used for heating in this indirect way, emphasizing the points that gas can be conveyed without heat loss to the point of use and employed with proved efficiency there, that it is wholly flexible in response to demand, and that it is not limited to low temperature purposes. Large hot water systems are comparatively slow to respond to control, and rooms temporarily unoccupied tend to continue on full heat. There are circumstances where high temperature radiant heat offers opportunity for much lower heat input for better result, and the greater flexibility of gas may lead to a fuel saving of 20% or more. In any event, before a steam district heating scheme is accepted there should be enquiry into what gas could do; and only if gas prices exceeded 4d. a therm could district heating by steam or hot water deserve consideration on economic grounds.

We return to the subject in view of the interesting comments made by Mr. J. E. Davis in his Paper to the London Juniors (last week's "JOURNAL"). Referring to the three major groups of cost—customer cost, demand cost, and commodity cost—he pointed out that in the case of district heating systems the distribution equipment is very costly, and because of its nature and the nature of the service it provides must be designed in the first instance for the maximum demand likely to be experienced. The annual charges on this installation also fall to be regarded as a customer cost. In addition there is the continuous loss of heat from such a distribution system, and the value of the heat so lost in a year becomes a further addition to the customer cost. The customer cost for gas or electricity in an urban area is about the same for the two systems, and before the war would have been in the neighbourhood of £2–£3 per annum. The customer cost for a district heating system would vary according to the density of demand; it might vary from £5 to £15 per annum. Published details of district heating schemes show that a capital expenditure of £80 to £120 per dwelling is contemplated. With such a sum available a gas undertaking could not only build the necessary manufacturing plant to meet the maximum demand, but would also have a balance of £40 to £60 per house to provide appliances.

Restricted Coke Supplies

The Minister of Fuel and Power has announced that because of increased requirements of coke for essential war production, the supply of coke for the ordinary industrial and domestic market must be restricted, and he has urged all consumers to exercise the utmost economy and to do all they can to conserve their existing stocks. In contrast with the position a year ago, when stocks were high, there is an acute shortage in most areas, due partly to the substitution of coke for coals which have been in short supply, and partly to the implementation of the Ministry's order to gas undertakings to make the maximum quantity of carburetted water gas. Although programming has been adopted to secure the most equitable distribution possible, local shortages are likely to be unavoidable. Undertaken by the District Coke Associations through representatives appointed by the Coke Directorate of the Ministry of Fuel and Power, the system of programming has entailed a great volume of work, but it has undoubtedly resulted in more effective distribution of the available coke, with a minimum disturbance to the existing channels of supply.

Teamwork in Industry

A patriotic handbook, *Battle Together for Britain*, which was recently discussed at meetings of the St. Austell Council, led to the idea of a joint display of gas and electricity. During last month a joint exhibition was staged in the Gas Showrooms, St. Austell, by the St. Austell and District Electric Light and Power Company, Ltd., and the St. Austell Gas Company, Ltd. Photographs and plans of post-war kitchens, both electric and gas, loaned by the E.D.A., the B.C.G.A., and the Bristol Gas Company, were displayed, together with some of the latest models of gas and electric cookers. A combined gas and coke range was also on view. Judging from the results the public welcomed this unusual demonstration of the "pull together" spirit.

Personal

Mr. E. WILKINSON, Chief Engineer of the General Gas and Electricity Company, Ltd., has joined the Board of Directors of that Company. Mr. Wilkinson has been connected with the Company since it was formed in 1930, and for many years prior to that was the Engineer to a number of the Companies which at present comprise the General Gas Group.

* * *

After 58 years of continuous service with the Kettering Gas Company, Mr. THOMAS E. MADDOCKS, F.C.I.S., Managing Director and Secretary, is resigning at the end of this year. He is, however, retaining his connexion with the Company in a consultative capacity. Under his charge the expansion of the business of the Company has been nearly sevenfold, and the area of gas supply to-day is 100 square miles, whereas in the early days it was only four square miles. In addition to Kettering, gas is supplied to two other towns and two villages. Mr. Maddocks was made Manager and Secretary in 1889, after being three years with the Company as Clerk of Works and Assistant Manager. He was appointed Managing Director in 1935.

Diary

Dec. 21.—Fuel Luncheon Club: Luncheon at the Connaught Rooms, Kingsway, W.C. 2, 1.10 p.m. Address by Dr. E. S. Grumell.

Feb. 23.—Institute of Fuel: Joint Conference with National Smoke Abatement Society.

Nationalization of Fuel and Power

At the Labour Party Conference last Thursday the proposal was put forward that the General Election programme should include the transfer to public ownership of the land, large-scale building, heavy industry, and all forms of banking, transport, fuel, and power.

The Security Ban on the issue of the accounts of public utility undertakings has been relaxed, and the Chertsey Gas Consumers' Company (one of the South-Eastern Gas Corporation group) is the first to issue its annual statement in the old form, including particulars of gas purchased, sold, &c. Net revenue for the year to Sept. 30, after providing for debenture interest and other expenses, was £4,680, and final dividends have been declared making £6 6s.% for the year on the 5% Standard Stock, £9 13s.% on the 7% Standard Stock, and £12 7s. 6d.% on the 10% Standard Stock. The Company purchased 281,845,000 cu.ft. of gas during the year, and sold 260,257,500 cu.ft.

National Gas Council

A Meeting of the Central Executive Board of the National Gas Council was held at Gas Industry House on Dec. 12. Mr. Frank H. Jones presided.

It was reported that the Memorandum of Evidence on behalf of the National Gas Council had been dispatched to the Committee of Enquiry into the Gas Industry, and that the proposals for amending existing Gas Legislation referred to in the Council's Memorandum of Evidence were now in the printers' hands, and would be forwarded shortly to the Committee of Enquiry.

A list of the members of the National Fuel Advisory Council appointed by the Ministry of Fuel and Power had been circulated. The Board approved arrangements for maintaining contact between the Gas Advisory Committee and this Council.

A report on the general coal position was received.

It was reported that the Ministry of Fuel and Power had appointed Mr. C. H. Chester to the National Coal Board and to the Public Utilities Coal Committee, and that both these appointments were in succession to Mr. S. Tagg.

A report was received from the Chairman, Mr. A. E. Sylvester, on the meeting of the Gas Advisory Committee to the Ministry of Fuel and Power held the previous day, when the matters discussed had included that of labour, gas appliances generally in relation to the Government housing programme, and purchase tax.

A report was received from the Chairman of the B.G.F., Dr. E. V. Evans.

It was stated that at the meeting of the Council of the Conference of Public Utility Associations on Nov. 28, Mr. Sylvester, the Chairman, had reported on the following matters:

(a) *Price of Coal.*—A Meeting between the Coal Controller, Sir Hubert Houldsworth, Mr. Foot, the Chairman of the Mining Association, and himself as representing the Conjoint Conference relative to this question.

(b) *Purchase Tax.*—The suggestion that the Conjoint Conference should in future conduct negotiations with the Government with regard to the removal of this tax upon domestic equipment was sympathetically considered.

It was agreed that the time had arrived when an annual general meeting of the Council might again take place, and that it might conveniently be held on June 13, 1945, during Institution week (June 12–15).

A letter was read from the South Wales Co-operative Tar Scheme, referring to the joint approach to be made by the Tar Advisory Sub-Committee of the National Gas Council and the Price Structure Sub-Committee of the Association of Tar Distillers to the Coal Tar Controller, in an effort to seek some relief from the heavy burden which producers of tar were bearing by reason of the increased cost of production of crude tar without a corresponding increase in the return on the products of distillation. The letter went on to ask that the Tar Advisory Committee should urge upon the Tar Controller the urgent necessity for an increase in the selling price of products to meet increased costs. It was understood that the Committee would meet again in January next, when the matter would be discussed.

It was agreed that the next meeting of the Board should be a joint meeting with the Executive Committee of the British Commercial Gas Association, to take place on Jan. 9.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

Our photograph was taken during a demonstration on the use of dried eggs held by the Ministry of Food at the Showrooms of the Leamington Priors Gas Company.

Gas Undertakings Under Bombardment

Four and a Half Years of Endurance and Service

LAST week, under conditions very different from those of a few weeks previously before the last German coastal gun had been silenced, we toured the South-East Coast, and we are now able to tell the story of what four gas undertakings—Dover, Folkestone, Ramsgate, and Deal—suffered through aerial bombardment and long-range shelling over a period of four and a half years. The experience of these undertakings has been bitter, the damage caused has been great. But throughout this weary, anxious, and distressing time, gas service—thanks to the undaunted spirit of all those concerned, disregard of personal danger, and display of resourcefulness under grave difficulties—has been given practically without a break. The same applies, we would hasten to add, to electricity and water services, which will no doubt be recorded elsewhere. The whole reflects to the highest credit of the public utility undertakings and the fortitude and courage of their personnel; it is inspirational.

Straightway let us have regard to a few figures. They are cold in themselves, but it takes little imagination to picture what they have meant to the coastal towns concerned. "Hell Fire Corner" is apt description. In that four and a half years, we were informed, over 2,000 shells (air-bursting, contact-bursting, and armour piercing) crashed into the small harbour town of Dover; from the skies about 700 high explosive bombs, three parachute mines, and seven flying bombs—to say nothing about incendiaries—found their mark on the town. Not a single dwelling escaped damage. Folkestone had 219 shells, 523 H.E.'s, and 19 fly bombs (and we might mention here that 602 fly bombs were destroyed by our defences just off Folkestone's coast). Ramsgate had 42 shells and 692 H.E.'s, over 500 of which were showered in one "packet." As a matter of fact it was on a visit to the Ramsgate Gas Undertaking in August, 1940, that we had this war's bomb baptism, having had the *apéritif* of machine-gunning on our journey. The small town of Deal, with its 120 shells and 173 bombs, did not escape enemy attention. These coastal towns are scarred and battered. After an unprecedented ordeal they breathe again. Their record is in truth splendid.

Now that the veil can be lifted, we may take a glimpse of what the gas undertakings of these four coastal towns had to face.

RAMSGATE

On Aug. 24, 1940, the Ramsgate Gas-Works had the unfortunate distinction of being the first to suffer serious damage in consequence of enemy action. At that date this was the heaviest raid which had taken place on this country, and 545 bombs fell on Ramsgate within a few minutes, 16 of which fell inside the boundary of the Gas-Works. A very great deal of damage was caused both to the manufacturing plant and the district mains. Gasholders, oil tanks, and buildings were set on fire. All the neighbouring Undertakings sent men and equipment to Ramsgate to help with repairs, and by the evening of Aug. 29 gas mains and services had been attended to and a supply of gas from Broadstairs was opened on to the Ramsgate system to clear the mains of air. On Monday, Sept. 2, the works were again in production, and gas made in Ramsgate was turned on to the town on that day. The official Examiner's report showed that the calorific value was 479 against the declared calorific value of 475.

One of the holders was so perforated with splinters that 270 patches were necessary to make it serviceable.

The next occasion when damage was caused occurred on Nov. 2, 1940, when a bomb of heavy calibre fell on the gasholder site adjacent to the holder which had been so badly damaged on Aug. 24. Again the holders were set on fire, and extensively damaged, but the gas supply was resumed the same day.

On Nov. 18 three high explosives hit the works and fractured the inlet main to the holders, inlet to the water gas meter, outlet to the holders, and other plant. The gas supply, of course, failed, but a small supply was turned through from Broadstairs, which had the effect of permitting most consumers to have sufficient gas. By Nov. 31 repairs had been effected and the gas supply to the town was resumed.

On the night of June 28–29, 1943, an enemy shell of large calibre fired from across the Straits of Dover detonated close to the boiler-house chimney. The two 24 in. mains under the ground at this point were shattered, and considerable damage was done to the purifiers. Once again both gasholders were perforated in a number of places and were set on fire.

Other damage of a minor nature occurred from time to time, and the last report of enemy action which affected the Ramsgate Gas Undertaking was on Jan. 20 of this year, during the time the town was being shelled by cross-channel guns. Again, one of the holders suffered and splinters pierced it in 22 places.

For his resourcefulness and undaunted spirit the Gas Engineer, Mr. R. H. Ruthven, has been awarded the M.B.E. (Civil Division).

DOVER

In Dover 72 mains were damaged by shell and bomb. Enemy shelling of this area started on Aug. 12, 1940, and during September a 14-in. shell burst within a few yards of the Company's Works, but fortunately this did no extensive damage. Another two shells exploded on the roof of the governor house and Company's Offices, a portion of the building and roof collapsed and caught fire, burying the governors in the debris and shutting off the town's supply for a short period. This incident was promptly dealt with by the Company's section of the Home Guard and other employees, who extinguished the flames. By their action they undoubtedly prevented more serious trouble occurring.

A gasholder of 750,000 cu.ft. capacity was, on June 12, 1941, completely wrecked by a parachute mine which landed about 100 yards away from the works. The other two holders were also damaged, and extensive damage was also caused to the works buildings. The gas supply was interrupted for a period of 5 hours; during this time it was found that gas production could be continued without the holders by using the compressors supplying the East Kent Gas Company's area to pump away the gas which was produced in excess of Dover requirements, into holders at Whitstable, 25 miles from the Dover Works. One holder has been damaged on two other occasions, and another on three occasions, once by cannon shells fired by enemy aircraft.

On Oct. 21 a shell fell alongside the gas purifiers, causing extensive damage to the sideplates and covers, and on Dec. 10, 1942, two shells fell alonside the retort house, causing extensive damage to the building, but fortunately none to the plant. There have been many occasions when shells have fallen in the vicinity of the works. Shelling continued till the silencing of the last cross-channel gun at the end of September of the present year, and during the last fortnight of bombardment the shelling was continuous. Working conditions through this ordeal can well be imagined.

In common with the other undertakings—and this, of course, has been general throughout all public utilities—at no time during the war have any members of the staff and employees failed in their devotion to duty, and work has gone on when air raids and shelling were still in progress.

During our visit we were told of many instances of individual heroism which resulted in the saving of lives, of gas undertakings' staff risking their lives cheerfully in the carrying-out of their duty—risking their lives cheerfully when "novelty of the occasion" had long since passed. Debris, debris, everywhere, with the gas man doing his part.

Co-operation

Dover knows what co-operation means in time of stress. Undertakings in the area worked as one and with a single aim. Bomb and shell damage to mains has on occasion been beyond the capacity of the Dover staff to remedy swiftly. That it has been remedied in a matter of hours is due to the mutual-aid idea put to practical test and not found wanting. Rochester and Canterbury, Whitstable and the adjacent undertakings of Folkestone and Deal, have often been on the scene to good purpose.

There is another aspect of the work which calls for mention. It is long since the Dunkirk evacuation. At that time both staff and employees of the Dover Gas Undertaking did real service as stretcher bearers, the while improvising canteens for the troops landing—and, as an incidental in an eventful life, helping in such sundries as the construction of road blocks to repel the might-be invader.

FOLKESTONE

The Folkestone Gas Undertaking's war service started in earnest in 1940, during the "phoney" period. At the beginning of the year employees spent their spare time building pillboxes and fortifications, barricades for roads, concrete foundations for naval guns, and so on. That was before the first bomb, which, with some of its fellow-kind, fell on the East Cliff on July 6, 1940—the forerunner of 115 incidents involving damage to the Company's mains by bomb or shell. During the Battle of Britain the enemy tried with dive-bombing to demolish a holder, but the results were "near misses." On Nov. 25 the cannon shells of German fighter bombers went through the holder at Hythe. Top lift, second lift, and tank were perforated. There was fire. But no interruption occurred in gas supply.

Which brings us to the "tip and run" raids, which started on March 15, 1942, by a stick of bombs released on Sandgate by an enemy raider which very nastily came in with our own returning aircraft. Actually the worst damage to the Folkestone Works was on April 14, when fighter-bombers flying at 500 ft. found their target to the extent of breaking an 18-in. main to the western district, the 9 in. main to Hythe,

and damaging the retort house, exhauster house, boiler houses, pump room, and carburetted water gas plant. A 1,000,000 cu.ft. holder, either penetrated by cannon shell or fractured by blast, was set alight. The wind was high and precluded any chance of extinguishing the flames.

Shelling started in August, 1940, and was carried out at intervals until the enemy guns were finally silenced last September. A shell of large calibre caused serious damage to the works in the December of 1942, demolishing a holder, a scrubber, and parts of the benzole plant, and causing damage to two holders as well as numerous buildings. For their work in helping to subdue the ensuing fire, three of the staff subsequently received special commendation for gallantry. The first holder to be damaged was brought into use again in November, 1942; was hit again in 1943, this time by cross-channel shell. It was repaired and ready for use again when it was damaged last August. All is now "in order." Two other holders were damaged in 1943.

Folkestone was never without an adequate supply of gas. Why? The answer is once again easy. At all hours and irrespective of enemy fire, the Company's men were ready to work, and did work.

DEAL

During the Battle of Britain there were 11 occasions when the mains of the Deal and Walmer Gas Company were broken by bomb attacks, but gas supply to the town was not interrupted on any occasion. Six "tip and run" raids were made without finding their target in the works, though the works had to be evacuated one day due to UXB. All three holders were damaged by bomb, cannon, or shell, one of them, previously twice damaged, being punctured twice in a single day—Jan. 20, 1944—and again in August of this year. Bomb, mend; shell, mend; shell, mend; shell—and now, once again, mend. And when the Company's men were not attending to local damage they were helping Dover or Folkestone. There was no respite. Shift relief men getting on in years—men who had had to contend with sickness and poor health—they all turned up for duty during raids or shelling. The community had its gas supply.

At an informal luncheon during our tour last week, Sir John Dalton, Regional Controller, said that the work of the staffs and employees of the public utility services during the four and a half years had been superb. Except for the briefest of periods, a matter of hours, the community had enjoyed a constant supply of gas and electricity. The mutual-aid scheme had, of course, proved its usefulness. The scheme came into being in 1941, and the organization was such that help could immediately be sought from gas undertakings in the area as far away from the coast as London. He paid high tribute to the invaluable services of the Deputy Controller of the S.E. Region, Mr. G. le B. Diamond, Engineer and General Manager of the Rochester, Chatham, and Gillingham Gas Company.

Watson House Centre

On Dec. 8, at the invitation of Mr. A. E. Sylvester, Managing Director of the Gas Light and Coke Company, a meeting was held at Gas Industry House of some 50 of the Senior Officials of the undertakings which have associated themselves on a subscription basis with the work of Watson House.

Mr. Sylvester welcomed those attending the meeting. He reminded them that Watson House was opened 18 years ago, that in 1933 it became one of the Industrial Development Centres, and that in 1936 the services offered to members were enlarged to include work on the use of gas for domestic purposes. Membership of the Centre has for some years exceeded the Gas Light and Coke Company in terms of gas made and includes undertakings as far away as Shanghai and Buenos Aires, in all over a hundred members, or in total about a third of the Gas Industry. In addition to this association, which is largely regional, the Newcastle Industrial Development Centre co-operates as a member in respect of domestic work, and Glasgow has recently followed suit.

Mr. Sylvester then raised a number of points which he had in mind when suggesting the meeting. The Centre has become very large and somewhat scattered. Is it too large? he asked. Should membership be limited on a geographical basis? Should it in part be grouped into such sub-sections as the Eastern and Southern Districts? Should it remain as hitherto, but with additional staff to visit the more distant undertakings when required?

Mr. Sylvester emphasized this was a matter for members to decide, and promised that if any group of members wished to set up laboratories and workshops of its own, the Company or Centre would do everything possible to help. It was, however, for consideration whether even 11 or 12 existing national districts could each support its own adequate workshops and laboratories. A compromise might be found in the development of 4 or 5 full-size Centres for the country by the co-operation of Districts, each of which could retain its identity by means of Committees.

The scope of the Centre could be widened, if thought fit, by an occasional meeting of the kind they were now holding. These would not take the place of the industrial and domestic technical meetings, but would provide opportunity for those responsible for policy to discuss non-technical matters of common interest to which the technical work of the Centre inevitably gives rise.

The work of Watson House is to be continued by the Gas Light and Coke Company on as large and efficient a scale as may be required. Here is something which exists and is in working order, and so forms a better basis for evolution than could be obtained by drastic change. If at some future time the Industry or any section of it were able to offer facilities equally satisfactory, the Gas Light and Coke Company would have to consider the position of Watson House, but of this there is no prospect at the present time. Mr. Sylvester emphasized the advantage gained in the work of Watson House by its close association with the operation of other Departments in the Company, of which it is an essential part.

Subscriptions and Operation

The subscription received from members is not directed to relieving the Gas Light and Coke Company of part of its expenditure upon research and development, but towards further enlarging the scope and extent of such work.

The post-war subscription rate has yet to be decided, and members can be assured the Gas Light and Coke Company will be charged with at least its fair share of the total cost. While it would be wrong to refuse all information to non-members in the rest of the Industry, the policy must be to ensure that members who do contribute should receive full value for money in virtue of membership. Meanwhile, the Gas Light and Coke Company does conduct much research and development work, not only at Watson House, of wider range than is confined within the scope of the Centre; for instance, in recent months the efforts of various kinds in connexion with the Government's housing programme. Such efforts inevitably and rightly benefit the Industry at large.

The *Watson House Bulletin*, Quarterly Technical Reports, and the monthly meetings will be resumed and improved, subject to the suggestions of members. This, and the training courses, must result in some desirable degree of standardization of appliances, fittings, and technique, but an excessively rigid standardization might weaken the Industry by discouraging initiative on the part of the makers.

Certification of appliances on a national scale has been discussed. There are many practical difficulties such as have become familiar in America. A gas appliance cannot be properly judged apart from purpose, installation, maintenance, &c., over which the testing personnel may have no control. Deliveries may differ from the sample tested. If, however, the selection and control of virtually all appliances reaching the public, long exercised by undertakings, is thought to require more rigid regulation, the combined experience of members, close contacts with the manufacturers, and the facilities of Watson House can form the basis for well considered action.

In conclusion Mr. Sylvester complimented Mr. Masterman, Mr. Dieterichs, and Mr. Holliday in referring to their function in the activities of the Watson House Centre, and invited discussion.

Many members expressed thanks for the help they had received from Watson House, and all, with some reference to past or present criticisms, welcomed a continuation or enlargement of the services of the Centre.

As from Jan. 1 next the Central Offices of the York, Harrogate, and District Group of Gas Companies (formed early this year and comprising the York, Harrogate, Malton, and Easingwold Gas Undertakings) will be at 48, James Street, Harrogate. From that date all correspondence should be forwarded to this address.

Mr. R. Mason, Engineer and Manager of the Teignmouth Gas Department, represented the Teignmouth Company, Devon Home Guard, at the Stand Down Parade in London on Dec. 3.

A Demonstration House has been constructed by the Dundee Gas Department in the showrooms with the object of bringing to the notice of the public the contribution which gas and coke can make in the design of a labour-saving home. The exhibit is open for inspection by the public, and is representative of the ground floor of a villa type of house fully equipped with coke and gas appliances, the piping and flue arrangements being enclosed in a central core. The house will provide means for demonstrating and testing the running costs of appliances exhibited from time to time, and thus make its appeal to consumers desirous of seeing gas and coke in use in a good setting which links up price with convenience and service. The public are showing great interest in the exhibit.

A Report on the Analysis of Commercial Grades of Coal in the Nottinghamshire and Derbyshire area (Fuel Research Survey Paper No. 57, price 2s.), which has just been published by His Majesty's Stationery Office, forms a further substantial contribution to our knowledge of the coals produced in this important coalfield. These analyses are the work of the Fuel Research Coal Survey of the Department of Scientific and Industrial Research. Commercial sampling of the output of the collieries of Nottinghamshire and Derbyshire has already formed the subject of two previous papers in the series (Survey Papers Nos. 37 and 48), in which over 500 grades are dealt with. The present paper gives the results of a further 213 analyses.

Mechanization of Coal Records

Great simplification has been achieved and a large amount of manual clerical work has been abolished by the Liverpool Gas Company as the result of the mechanization of its coal records. A considerable amount of clerical labour was formerly involved in keeping these records at the separate works, and as the result of an investigation into the methods of recording the quantities of coal received by the Company the punched card system was adopted, and the consequent centralization effected a substantial economy in clerical labour at the works offices on this particular class of work.

The Company has four main gas-works at which coal may be delivered. In normal times two of them take delivery by railway only and the other two may take delivery normally by three methods: (*a*) by rail direct to one of the works; (*b*) by canal barge direct; and (*c*) by rail to tips, where the railway wagons are tipped into barges and then by canal to the two works. Approximately 400,000 tons are received annually from 72 collieries, the supplies being received from various coal areas. Based on an average of 10 tons per wagon, about 40,000 wagons have to be recorded each year.

Describing the change-over from manual to mechanical recording in an article in the *Powers-Samas Magazine*, Mr. T. A. Crabtree explains that when the records were mechanized provision had to be made for the following returns and statistics:—

Daily: Amount of coal received, for delivery control purposes.

Weekly: (1) Analysis of cannel and coal under (*a*) quantity received by rail, canal, or other means, and (*b*) quantity received from the different coalfields. (2) Internal statistical return of quantities received (also used for delivery control purposes) analyzed under (*a*) the factor supplying the fuel, (*b*) type of fuel (*i.e.*, grade and colliery from which supplied), and (*c*) quantity of each type of fuel received. (3) Comparison of actual weights received with those advised for individual wagons, to check under or over deliveries. (4) Weekly shut-out (coal in transit).

Monthly: (1) Tabulation for checking factors' invoices, showing (*a*) factor, (*b*) colliery and type of coal delivered, and (*c*) advised weight received. (2) Monthly shut-out (as in certain cases the Company pays in advance for advised deliveries shut-out).

The first step in mechanizing these records was to initiate a series of codes to bring out the necessary detail, and the codes were made up into a folder for easy reference and supplied to the works offices. Clerical work was standardized into the completion of two daily forms, a coal advice sheet and a weighed-in sheet. The coal advice sheet is simply a record of the advice notes received from the factors, showing the date, coalfield area (coded), factor (coded), works receiving the fuel and method of delivery (coded), wagon number, train number where a full or half train is consigned, and advised weight of each wagon. The weighed-in sheet is identical, excepting that the weights are those recorded by the Company's weighing machines.

An operations chart shows how simply the returns are prepared in the Company's Powers-Samas department. From the comparison between advised and received weights, use is made of an interpolator for bringing together the advice cards and weighed-in cards for each individual wagon. By crediting the cards representing the weighed-in quantity, the subtraction unit on the tabulator automatically extends the differences of weight for the individual wagons and barges. Large discrepancies are examined and taken up with the factors.

The transition ran quite smoothly, and to cover every contingency the Company ran the two methods concurrently for a month at each of the works. An interesting point was that three wagons each having the same number were received in the first week's trial at one works, but by adjusting the interpolation and tabulation controls to cover the type of coal, no difficulty was experienced in dealing with this type of complication.

Keith Piercy, Ltd., announce that to simplify sales office organization their business, which consists of the supply and technical servicing of Calgon and other phosphates used in water treatment, will be carried on from Jan. 1 under the name of their parent company, Albright & Wilson, Ltd., chemical manufacturers, Oldbury, Birmingham. The general development of the water treatment business will remain under the direction of Mr. Keith Piercy, and Mr. L. W. Stubbs continues as Manager of the technical sales organization. Sodium metaphosphate, better known under the trade name Calgon, was introduced into this country by Mr. Piercy in 1933, and the Company which bears his name became associated with Albright & Wilson, Ltd., in 1935.

The December Issue of the *Broomwade News Bulletin* announces that a maintenance and service record chart is being incorporated in new editions of instruction books issued for Broomwade portable sleeve valve air compressors. Loose copies of the charts ready to clip into old instruction books are available for owners of these compressors, and will be sent free on request. Applicants should state whether their machines are petrol or diesel engine driven.

The Quasi-Arc Co., Ltd., Bilston, Staffs, have issued a technical circular (No. T.C. 557) relating to the properties of their "Radian" electrodes for welding mild steel and high tensile structural steels to B.S. 968. The electrodes consist of a high quality mild steel core with a fully extruded covering, grey in colour, and of sufficient thickness to give extreme ease of welding and a very smooth finish to the weld.

Selection and Training of Personnel

A Discussion on "The Selection and Training of Personnel for Industry" was held under the auspices of the London and Home Counties' Branch of the Institute of Physics on Dec. 2. Dr. S. Whitehead, M.I.E.E., F.Inst.P., the Chairman of the Branch, presided.

The opening Address was contributed by Major F. A. Freeth, F.R.I.C., F.Inst.P., F.R.S., of Imperial Chemical Industries, Ltd. Representing as he does one of the largest employers of scientists in the country, and having had many years' experience of selecting and training personnel for industry, his Address proved stimulating, important, and provocative; it contained many practical suggestions for the education and training of scientists for industry. The points to be kept in mind when making a selection were, he said, a man's general intelligence and the possibility of his development over a long period in the right atmosphere. Interviews should be kept as informal as possible, and the greatest pains should be taken to make the candidate feel at his best and at his ease. Every endeavour should be made to find out his likes and intellectual interests. The greatest allowances should be made, especially at the present time, for the effect of the war upon his educational career; and at all times the most sympathetic allowances should be made for a man who has not had much chance of general education and experience of the world in his youth. Within industry itself, every possible effort, he said, should be made to encourage scientific and intellectual enthusiasm. When possible the stimulus of travel and visits to scientific and technical conferences should be used. The man in industry should be encouraged to be on particularly good terms with people in that branch of science in which he is engaged who are in the Universities.

He thought that men whose performance in University examinations had been poor should not be overlooked, as there might be some good reason for this. Generally speaking people who did well in examinations were industrious and they might very well have brains, but occasionally success in them proved to be no more than a feat of memory. Major Freeth commended the selection work of psychologists in this war, and thought that every encouragement should be given to them to assist in similar problems for industrial recruitment. He thought the crux of the whole matter was to regard a man's education as having for its purpose "getting him into a frame of mind where he will go on building up on himself for the rest of his life, or in other words his degree is merely an incident in his upward flight." "The other end of the scale," he said, "is the man who on obtaining his degree, says, 'I'm qualified,' and potters along till he reaches his grave." He deprecated the idea that a man was a kind of *doctor mirabilis* when he had graduated, and said that he had never been happy about the Ph.D. degree. He pleaded for more training in the writing of clear English, particularly for those who had to present reports and appreciations of other people's work; and he was supported in this by several speakers in the general discussion which followed.

One speaker from a large industrial concern said that the attitude of some Universities was "industry must take whatever we offer," but in his view, if the University did not offer to industry men it could readily employ usefully, industry would in its turn ignore the Universities and set up its own education and training schemes. This view was challenged, and several other speakers from industry stated that they did not expect entrants to their organizations from University and Technical Colleges to be employed on productive work until they had gained the special training and experience requisite for their particular industry—a matter of six months or more. They wanted the Universities and Colleges to provide them with good scientists having broad rather than deep knowledge, and they would attend to the rest.

Replying to the discussion, Major Freeth said that there was a very great demand for more libraries and books, and he did not think that the supply of these could be overdone. He certainly did not expect men to come from the Universities and Colleges "ready made." One new graduate had complained to him that he did not like working for other people's profit, and he had to remind him that he was in fact working for other people's loss! It was very desirable that the prestige of the newer Universities and of the Technical Colleges should be more nearly matched to that of the older Universities.

Primitiva Gas Company

It is reported from Buenos Aires that, although the amount of compensation to be paid has not been finally settled, the Federal Court has ordered the Primitiva Gas Company to hand over its properties immediately to the Argentine State for the sum of 17,147,731 pesos (about £1,000,000), which has been deposited by the Government. When the question of expropriation was first raised last April the Argentine Government offered only 3,758,740 pesos (£230,000), and the Company appealed to the Federal Court, with the result that the offer was increased almost five-fold. This offer was also opposed by the Company on the ground that it appeared to give a liquidation value of the assets, whereas what the Government proposed to acquire was a going concern earning a reasonable profit and giving good service. In the latest ruling, the Federal Judge said the question whether or not the price was adequate would be analysed later, and then a final adjustment would be made.

The Production of Gaseous Hydrocarbons by the Hydrogenation of Coal

Eastern Counties Association Discussion

Dr. **F. J. Dent,** Joint Assistant Director of the Gas Research Board, presented a summary of his Paper on "The Production of Gaseous Hydrocarbons by the Hydrogenation of Coal" (published in full in the "JOURNAL" of Oct. 18 (p. 502) at the autumn meeting of the Eastern Counties Gas Engineers' and Managers' Association on Nov. 30. The presentation of the Paper was followed by an informal talk on "Research in the Gas Industry" by Dr. **J. G. King,** Director of the Gas Research Board (reported in the "JOURNAL" of Dec. 6), and the following discussion on the two communications ensued.

Dr. **E. W. Smith** said he was relieved to know they had now got a Director who had what he thought was a properly balanced view of the arrangement of research and the method of attack for the Gas Industry. He was also pleased to think that apparently the Council of the Gas Research Board was going to push forward by giving him greater facilities as soon as possible, and that Dr. King himself would get the help of the very best men available, either from outside the Industry or from inside, for prosecuting that work. They had all got to be extremely patient. Research was a long term programme, and they must not be too anxious for cash results too quickly. They must not be critical of the little information they might get from time to time as to the methods of approach, or as to what subjects were being tackled. They must have confidence in the people who were working, because it was quite certain that those who were not engaged in the work were not in a position to criticize except on very broad lines.

Dr. **A. J. V. Underwood** said he thought considerable credit was due to the Gas Research Board for taking up long-range research and development of the kind that had been described by Dr. Dent. The Gas Industry was one of our oldest industries, and the most progressive ideas were not always found in the oldest industries. In this matter the Gas Industry might paraphrase an old song and say, "I may be old but I've got new ideas." The hydrogenation of coal to produce gaseous hydrocarbons was a reaction of considerable scientific interest, and might also develop into one of industrial importance. It was very gratifying that the original research work on this reaction was carried out in this country, and that the development was being followed through in this country. The carrying out of the reaction by the use of a self-propelled reaction zone was very interesting, and work on these lines would undoubtedly yield valuable information about the reaction. It seemed, however, that this technique might present considerable difficulty in large-scale operation. Apart from the limitations which it would impose on the choice of the raw material in regard to size-grading and caking properties, control of the reaction would probably prove to be very difficult. The course of the reaction was affected by the temperature and the concentration of hydrogen. The concentration of hydrogen at any point in the reaction mass was determined by the rate at which hydrogen was circulated and the rate at which it was converted to methane. If an attempt was made to control the rate of reaction by means of the quantity of hydrogen circulated, this did not give independent control of the temperature factor and the concentration factor. The rate of reaction seemed to rise with the temperature up to a certain point, and then fell off as the temperature rose further. Additional cooling by an increased circulation of hydrogen might thus either decrease the rate of reaction or increase it, depending on the temperature conditions which prevailed. The effect was rather like that of blowing cold air on to a fire, which might either die down or burn more vigorously. An increased flow of hydrogen which produced cooling by absorbing heat of reaction could also produce the reverse effect by increasing the concentration of hydrogen, and thus increasing the rate of reaction. The two factors would tend to neutralize each other. If the reaction were to be carried out with a static mass of considerable depth, it would seem to be necessary to supply a constantly increasing quantity of hydrogen as the reaction progressed through the mass. The rate at which the hydrogen supply required to be increased might be considerable with a bed of substantial depth. The deeper the bed the greater would be the preheating of the hydrogen as it passed down through the residual coke, absorbing heat from it and from the walls of the reaction vessel. The cooling effect of the hydrogen when it reached the reaction zone would thus become progressively less.

Actually it would seem that with this method of carrying out the reaction the real control was that imposed by the temperature rising to a point at which the reaction ceased to take place, or the concentration of hydrogen falling to a point at which the reaction ceased to take place. If this was the ultimate mechanism of regulation it would appear to be very difficult to achieve high conversion of the coal or coke into hydrocarbons. Dr. Dent and Dr. King had referred briefly to the possibility of continuous operation using coal in pulverized form. Although there would obviously be engineering problems to solve before this could be achieved in practice the principle was fundamentally attractive. As had been indicated by Dr. King, one might visualize two possible types of operation. One would be similar in principle to that used in the Winkler gasification process, where a mass of small particles was maintained in a teetering condition. A similar technique was that of the fluid catalyst used for cracking petroleum. The other type of operation was similar to that used in the Schmalfeldt gasification process, in which fine coal was gasified while carried in a current of gas and steam. The choice between these two methods of operation would probably be determined largely by the rate at which the reaction took place.

The use of coal in the form of fine particles instead of in a static bed seemed to offer three potential advantages: (*a*) It would not be necessary to use a sized coal; (*b*) it should obviate difficulties due to caking; and (*c*) it should facilitate the maintenance of a uniform reaction temperature through the mass, and it should also facilitate control of the reaction temperature and the removal of the heat of reaction by adjusting the temperature of the incoming gas or by recirculating a quantity of cooled gas. Greater possibilities of control would give a greater degree of flexibility to the process. Another potential advantage would be that it should permit of the reaction being carried further towards completion, and might give a relatively small residue of coke. If this residue was small enough, the problem of gasifying it would not arise as it could be disposed of in other ways. It might be worth considering the possibility of using coal gas or coke oven gas as the source of hydrogen for the hydrogenation process. By low temperature fractionation, coke oven gas or coal gas with a calorific value of 500 B.Th.U. could be separated into two approximately equal fractions. One would be substantially hydrogen with a calorific value of roughly 300 B.Th.U., while the other would be the remaining constituents of the gas and would have a calorific value of roughly 700 B.Th.U. This rich gas might have a premium value to set against the cost of fractionation. There might be other incidental advantages of the low temperature fractionation process. All sulphur compounds and moisture would be removed in the process. In addition there would be recovered a fraction rich in ethylene which might be used for chemical synthesis. One of the difficulties in separating ethylene economically from coke oven gas was the disposal of the residual hydrogen, and normally the recovery of ethylene from coke oven gas was associated with the use of this hydrogen for synthetic ammonia or methanol. An additional large outlet for hydrogen, such as this coal hydrogenation process, would be an important factor in encouraging the separation of ethylene.

Mr. **F. B. Richards** (Woodall-Duckham Companies) said he would like to commend the wisdom of bringing research to the notice of the District Associations. They were rather apt to think that research was a thing set apart where a group of men did something for them, but what Dr. King had said should dispel that idea altogether. What they were entitled to expect was that having secured a very eminent man as Director, and another very eminent man as Assistant Director, those men should lead and direct their research, and they required the help of every one of them, each in the way in which he could help the best. As an example of the way in which some people might help, he would only invite them to consider the reference made that day to the work his Company had been privileged to do. Certain services were required by the Gas Research Board. His Company offered those services, and the Gas Research Board availed themselves of them. There were lots of other people who could offer their services, and he knew it was Dr. King's desire to enlist all the help he could, of any kind. Funds were often talked about in connexion with research, and they were necessary. Of course research was expensive, but what was much more necessary was men and ideas. They were very fortunate in their research organization, and they wanted to get ideas flowing forward on which they could work. The previous day he had the pleasure of attending the christening ceremony of another research association which was of considerable interest to the Gas Industry. He referred to the British Coke Research Association, which was holding its conference at Leeds. It seemed to him that in that Association they had another useful collaborator who could take on certain angles of the work they would like done. In connexion with coke, he would only like to mention the excellent address which the President of the Eastern Counties Association (Mr. W. J. Collins Garrard) circulated to them earlier in the year, in which he stressed that they must not only have a target for to-morrow, but a target for to-day too. Coke was with them, and in it they had a valuable asset. They had a seasonal demand for heat, and in coke they had one of the means of meeting the peak load, and he thought the work of Dr. King and their research organization generally might well be directed to the better adaptation of coke to the service of the domestic consumer.

Mr. **T. C. Battersby** (Watford) said they had thoroughly enjoyed listening to the claims of the possibilities of the future in the hydrogenation of coal and the synthesis of methane, and he had no doubt that much of that kind of work still lay ahead. He was very glad to notice that Dr. King never referred to the question of finance. The real difficulties were to find suitable personnel and suitable facilities for these experiments. No doubt there was a question of finance, and the Industry would have to provide a considerable amount of money for research. In America in pre-war days it was estimated

that the oil interests expended the equivalent of six million pounds a year on research, and he thought and believed that in this country they would have to spend a considerable amount of money on research into the utilization of our own natural fuel, coal. The people of this nation as a whole had become much more fuel conscious, and various other bodies were spending money on research. He hoped the Gas Industry would see that it left no stone unturned in pursuing every avenue in the future. Dr. King had outlined the programme which lay ahead. It was a big programme, and Dr. Smith had reminded them that they must not be too impatient of results. They could not help being impatient. They wanted to see coal utilized to better advantage and our resources applied more efficiently, and he believed to a large extent that could be done by gasification. The possibilities were immense, and the flexibility of the system suggested in Dr. Dent's Paper showed that they must apply the lessons of research to the extraction of gaseous and solid smokeless fuels.

Mr. **F. H. Robinson** (Bishop's Stortford) said the experiments on the hydrogenation of coal under pressure described by Dr. Dent were extremely interesting, but as the Author said towards the end of his Paper, the investigation was quite "fluid," and there was a lot of work to be done on the new plant. As an engineer and not a chemist or physicist he felt some diffidence in discussing the reactions and theories referred to, rather like an apprentice trying to criticize the work of his master. In the diagram of a continuous gasification unit shown in fig. 9 apparently the gas off-take was fixed close to the high temperature zone, so that any tar vapours were forced to pass through this hot zone. This would, of course, result in cracking these vapours, but it might be that other practical difficulties would be found. Many years ago with a view to decreasing the paraffin content of the gas and tar and increasing their benzole content, he had one downwardly heated vertical retort in a working bed altered so that the gas off-take was at the bottom in the coke extractor chamber, the customary top off-take being closed, thereby forcing the gases and tar vapours produced at lower temperature through the incandescent coke in the retort. Most effective cracking took place, but the process was soon brought to a standstill by the production of pitch (of excellent quality), which completely blocked the bottom off-take and also adhered to the outgoing coke. Running through the Paper and the Gas Research Report there seemed to be one main theme, the synthesis of methane from a gaseous mixture containing hydrogen and carbon monoxide by means of a catalyst. This suggested that blue water gas as manufactured in present-day plants might be utilized in conjunction with a catalyst of a robust nature to produce greater quantities of town gas of similar composition to to-day's gas. He would like to ask Dr. King and Dr. Dent whether any beneficial result would be obtained by introducing blue water gas at the base of a continuous vertical retort. Carbonization would then take place in an atmosphere with the hydrogen and carbon monoxide above the normal.

In the Research Report it was stated: "Methane content and calorific value increase with decrease of temperature and with increase of pressure. If a town gas of 500 B.Th.U. were aimed at (say, 30% CH_4), the maximum temperatures employable would be 570°, 665°, or 783°C. at pressures of 1, 5, or 25 atmospheres respectively." This seemed to indicate that from a practical engineering standpoint a temperature of 570° at a pressure of one atmosphere would be most desirable in order to keep down costs and simplify the machinery of the plant. Would it be possible to modify or utilize any portion of existing water gas plants to make them suitable for working within those limits? The only other question he would raise was how far should gasification be carried? In the experiments described apparently complete gasification to produce a gas of 500 B.Th.U. or thereabouts was aimed at. If this was the target, then other fuel would be needed to produce the steam required by the plant for gasification and for other purposes in the works, as there would be no coke available for sale. The waste heat available from the plant would be insufficient to produce the steam requirements of the works, as he knew from his experience in running a complete gasification plant 20 years ago of a capacity of half a million cu.ft. per day. Coal slack purchased specially would therefore be required for works steam production. The alternative would be to carry out gasification to, say, 80% of the requirements, leaving a balance of coke available for the raising of steam and for power production in the works. As engineers they would look forward to further developments of the process described by Dr. Dent, and would wish him every success in his work. Thanks were due to him for putting before them the results of the investigations; they appreciated to the full the painstaking work already carried out.

The **President** (Mr. W. J. Collins Garrard) regretted that time would not permit of further oral discussion, but he invited members to forward written contributions. He paid a warm tribute to Dr. King for his work, and described him as a research realist.

A hearty vote of thanks was accorded to Dr. King and Dr. Dent, on the motion of Mr. **Battersby** seconded by Mr. **R. Prince** (Peterborough), and Dr. **King** briefly replied.

A Written Contribution

Mr. **J. Hunter Rioch** (Cambridge) wrote: We are greatly indebted to Dr. Dent for giving us such an attractive picture of what the gasworks of the future may be. It is to be hoped, however, that during the transition period, while hydrogenation is being explored, the possibility of further technical development in existing processes will not be neglected, and that research along such lines will also be continued. There is a definite attraction in producing gas efficiently and economically by low pressure methods, thus avoiding the introduction of the high pressure complication, interesting as this is from the technical aspect. I would mention that existing full scale carbonizing processes already operating have proved that it is practicable to secure a hydrocarbon enrichment value appreciably higher than was possible 10 years ago. Although I have no information as to the economics, it may be possible to secure still further hydrocarbon enrichment by the introduction of externally-generated hydrogen, and this point is perhaps worth looking into.

Attractive features of the hydrogenation process are that almost any type of coal can be used, and that coke production will be completely under control, if not eliminated entirely.

I would be interested to know whether the crushing of coal to sizes below 1 in. is a requirement confined to the 7 in. high pressure vessel, or whether that is the maximum size which it is expected will be likely to give satisfactory reaction conditions, even on full scale plant. If reduction to this size and grading is an essential feature, that in itself means introducing fairly expensive machinery to the gas manufacturing process, and if pulverization is necessary the cost will be still greater.

There is one other matter which seems to me to be very important. Gas produced by hydrogenation will presumably have a much more constant composition than normal town gas produced by various combinations of existing processes. Hydrogenated gas made at different stations should be much more similar than is at present the case. A much narrower range of combustion characteristics will therefore have to be provided for in the different types of gas-consuming appliances. This in itself will have tremendous repercussions on appliance manufacture, and will materially assist in improving the efficiency of gas utilization and the cheapening of gas appliances, matters which are not only desirable, but essential to enable the Gas Industry to maintain and increase its service to the community.

Now coming to Dr. King's Address, I believe many of us have felt for some time now that the extremely academic reports on researches carried out, while doubtless of interest to the larger undertakings, seemed to result in but little improvement in the standards of production and distribution of gas, which is, after all, the objective of such industrial research. The programme now drafted by the Gas Research Board appeals as being of a rather more practical nature, and this is to be applauded most heartily.

I will mention what appears to me to be one of the most important fields on the production side—namely, the removal of organic sulphur compounds from town gas. The Gas Industry has now been discussing for some 10 years at an increasing crescendo the desirability of removal of organic sulphur down to a figure of some one or two grains per 100 cu.ft., but although extensive laboratory research investigation of the problem has been made, it has been left to two of our largest gas undertakings to put down large scale experimental plant, and to take the commercial risk which it appears is the consequence of being the pioneer in a new process. Surely such work is in the interests of the entire Industry, and as such the financial burden should be apportioned accordingly, and further the work is of such importance that no danger of delay in development should be countenanced. For that reason I, for one, had sincerely hoped that the Gas Research Board would have been desirous of carrying the results of their laboratory investigations into the development stage, thus demonstrating the practicability and advisability or otherwise of any process under investigation. I therefore find the following extract from the Chairman's Address to the Gas Research Board on June 10, 1943, most disturbing, as the indications are that the Gas Research Board do not intend in the normal way to proceed beyond fundamental research, and are wary of entering the field which has heretofore had to be explored by plant manufacturers.

The extract to which I have just referred is as follows:

"The research work will not normally be carried beyond the fundamental stage, but it will not have served its purpose fully if it does not provide more work for development by the staffs employed in industry. It is possible that the Board may sometimes have to carry the examination of a new plant or a new process into the development stage, and if necessary it would not refrain from doing so."

To my mind this statement is too indefinite. The Gas Industry owes a great debt to the manufacturers in the development of plant in the past, but it seems to me that such development work as the design of plant for the removal of organic sulphur compounds on the one hand is of vital importance to the Industry and is one of its most pressing problems, and on the other, may be very expensive. For these reasons I ask is it equitable to expect manufacturers to take up the development of such plant with all the energy which the subject so richly deserves? My views are, therefore, that the Gas Research Board can only render the highest service to the Industry firstly by using the conclusions derived from its fundamental researches to design new plant likely to result in improved production and utilization, and secondly, with the co-operation and financial support of the Industry, by setting up such plant on a practical scale, thereby establishing or otherwise the anticipated improvements. My feelings upon this subject are perhaps the stronger in that there is at Cambridge a plant embodying a new principle of carbonization. That it could be demonstrated to the Industry that this new method of carbonization

was a practical success it was necessary that the manufacturers of the plant, jointly with my Company, should accept the financial risk involved. As long as the Gas Research Board restricts its field to fundamentals, for just so long will the Industry be dependent for its development upon the pioneering spirit or, if you prefer it, the willingness to take risks, of a small proportion of its constituent undertakings.

Mechanization of Laboratory Practice*

By WILLIAM MASTERTON, B.Sc., Tech. (Edinburgh)

I WANT to see gas and electricty oust the burning of raw coal from domestic grates and from factory installations. To do this our products must be cheapened, and how to do this should be the study of every technical employee of the Gas Industry. I would put forward the following proposals for your consideration:

First: How much of valuable hydrocarbons of high calorific value do we extract from the gas and thereby lose in the process of wet purification? I remember many years ago filling the tank of a sampling gasholder with tap water. The 24-hour gas sample collected in it was, day after day, 10 B.Th.U. lower than was to be expected from the average of the chart readings of a recording calorimeter running on the gas as made. I finally thought, can it be that the water is dissolving a significant portion of the hydrocarbons? I emptied the tank and refilled it with gas water, and the next day and thereafter the holder sample was in good agreement with the chart average. Now, if gas which has already been scrubbed with water for removal of ammonia suffers such a loss on contact with fresh water, the original gas will lose more. It would be interesting to know just what we are losing here. If the loss is important there would be a call for some other method of ammonia removal, or perhaps some modification of the present method.

Second: What does the Gas Industry pay for the measurement of its product? I think it pays far too much. A gas meter costs (say) £4 and is good for (say) 20 years. The consumer's gas bill for a year may be £4; that is, it takes his payment for a year to equal the cost of mere measurement. And only a portion (say 10%) of his annual gas bill is profit. It takes the profits for 10 years to pay for the meter! Such a cost for mere measurement seems to me exorbitant. It is a proposition which no practical grocer would contemplate in his business for a moment. The Gas Industry must, of course, have a meter in every consumer's premises, but it need not be an expensive meter. The statutory practice requires that a gas meter must be of positive type—an inferential meter is not tolerated. This is not fair

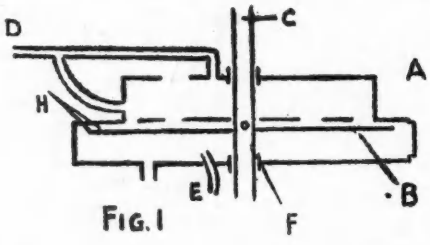


FIG. 1

to the Industry. If we could use very much cheaper inferential instruments, which while not so accurate as the present type of gas meter would be good enough, they would be more economical from the point of view of the Industry and its consumers. The adoption of cheap inferential meters would reduce the price of gas. Better a rough measurement of cheaper gas than an accurate measurement of dear gas. If we do not make a move to stop this out-of-date practice then we are straining at a gnat and swallowing a camel. The practice is doubly unfair to our Industry in that the electrical industry uses inferential meters—indeed it is the only type available for them. Their meters are expensive too, but that is no concern of ours. I do not see that because in our case positive measurement is possible we must have it. Further, comparing ourselves with the water authorities, whose commodity is generally supplied without measurement at all (it being a charge on the rates), surely it is not a wild proposal that inferential measurement can suffice for gas.

Third: An aid to total gasification. In the course of our session Dr. Grew, of the Physics Department of the Heriot-Watt College, is going to describe to us the method of Clusius and Dickel, by which gases of different densities may be separated from one another. The method is particularly applicable for the separation of hydrogen from coal gas, as the former is so much lighter than the other constituents of the latter. I do not want to encroach upon Dr. Grew's subject, but I hereby propose that the Gas Industry should enquire into the possibilities of the new method, which at present is purely a laboratory process, with a view to its application on the manufacturing scale. If it is possible to apply it on a commercial scale its significance to the Gas Industry will be immense. Recent work of the Gas Research Board would seem to indicate that the Gas Industry may in future require enormous supplies of cheap hydrogen for the total gasification of coal. There could be no source cheaper or better than town gas itself or blue water gas, especially in view of the fact that the new process is one of mere separation—not one involving the destruction of other components.

While the most obvious method of applying the process on the commercial scale would be simply to make a large scale version of the laboratory apparatus, I would like to put forward the suggestion that the apparatus may be designed in centrifuge form, and that in such form it might be even more effective.

A and B (fig. 1) are two circular metal plates mounted on a hollow axle, C. A has an annular slot in it. Gas at incandescent temperature (perhaps direct from a water gas generator) is admitted at D. The gas splits into two streams, which meet at a point in the annular slot. Here the gas streams flow through into the circular space between the two revolving plates. The hot gas streams passing over the upper plate heat it, while a jet of cold water, E, cools the lower plate. Perforations, F, allow of the passage of hydrogen through to the hollow shaft, while the heavier components of the gas pass out at H to the chamber below, from which the heavier gases and the water are drawn off.

The apparatus has not been made and tried, but I feel disposed to believe it would be successful. In the method of separation devised by Clusius and Dickel, the separation is dependent on a convection current, which is an effect due to gravity. In centrifuging one is dealing with hundreds or thousands of gravities, so that I should expect the separation to be more rapid.

Since writing the foregoing I have asked Dr. Grew if any suggestion of this nature has been put forward, and he referred me to a contribution in the *Journal of Chemical Physics* of the American Institute of Physics, 8,965, 1940. There Farber and Libby (Department of Chemistry, University of California) describe just this apparatus (with very minor differences) and their experience with it. They say: "A test of the effect of gravitational field on the operation of the Clusius-Dickel thermal diffusion method for gas separation has been made by use of a hollow disc with one hot surface, the whole disc spinning at various speeds. Linear increases in both the equilibrium separations and the rates of separation with increasing centrifugal force were obtained for speeds below a certain maximum value. Above this both the rate and equilibrium separations fall rapidly. He—CO_2 mixtures were used. The results indicate that the standard column would be improved if it were placed in a larger field up to ten times that caused by gravity. Theories for the action of the thermal diffusion column should show this. The apparatus cannot compete with the standard column type for isotopic separations, but may have some application to industrial separation problems." In their apparatus "the hot plate was heated by radiation from a nichrome wire heater wound on a transite sheet and mounted approximately 1 cm. from the brass surface." In the apparatus I have just outlined for industrial use the temperature gradient from hot plate to cold plate would be much greater than this with a consequent enhanced rate of separation. The authors themselves suggest this in their concluding paragraph.

Whether the method will ultimately bear commercial fruit or not, it is certainly a matter on which the Gas Industry should inform itself.

Fourth: A plea for the full use of mechanization. Mechanization is a modern phenomenon. Its appearance has raised economic, social, and even spiritual issues. It is to be found everywhere—in the factory at the actual point of manufacture, in the clerical office, in the chemical laboratory, and in the home. It is of all kinds—it may be heavy to replace work of the nature of mere brute force; it may be light to replace work which is intricate and fiddlesome; it may be such that it replaces purely mental processes. Whatever it is, its function is to lighten the burden of human labour in one way or another. It is a movement which an enlightened community would welcome. But it is a movement which at its beginning was opposed by riots, and which still to-day, in spite of its manifest success and manifest benefits, is opposed on one ground or another.

The objections to it are unsound, and I would ask those who have objections to it to analyze the matter, because if they did so they would divert their opposition from mechanization to the proper quarter.

The first and most grievous objection is that by doing away with work it results in unemployment. This, as all enlightened people acknowledge, is the fault not of mechanization but of the organization of production. Hours of working can be shortened; holidays can be lengthened. It is true that mechanization has resulted in unemployment, but it is also true that the shorter working day and higher standard of living which we enjoy compared with our ancestors are due to mechanization.

Fifth: Automatic cooker ignition. This subject is perhaps not strictly in order in a Paper aiming at cheaper gas service, but I will make the plea for its inclusion that since it relates to better gas service it bears at least indirectly on cheaper gas service.

The cooker load represents about 50% of all gas made. To make the best possible job of cookers is obviously one of the Gas Industry's

* Presidential Address to the Scottish Junior Gas Association (Eastern District).

most important problems, particularly in view of the fact that electrical competition in this field is going to be severe.

I consider it disappointing that so many of the best manufacturers seem to have committed themselves to the use of the flash tube for automatic ignition. The "spider" of flash tubes radiating across the hotplate from a centrally situated pilot light to each of the burners complicates the hotplate. Say what you like, a cooker is a dirty thing—the best that can be done about it is to keep it simple and easily cleanable, and that flash tube "spider" is a step in the wrong direction. There are automatically ignited cookers in the showrooms, and they will eventually be shown at Ideal Homes exhibitions. Under these conditions it certainly looks very smart simply to turn on the tap and show the ring lit, but by 10 years' time the housewives will have discovered that the modern gas cooker is dirty and inconvenient. Those who are making the cooker hotplate more complicated do not appreciate the world in which we now live. The modern housewife demands simplicity, convenience, and cleanliness, and if gas cannot give it her she will get it elsewhere.

As I suggested in an article in the Technical Press in 1942 there should not be any addition made to the hotplate—a gas ray from the side can strike across the hotplate and ignite any ring turned on. The device I then described did good service on my own cooker for some time, but later the valve in it became worn and gas leaked into the atmosphere of the room. I therefore sought for a type of valve which could not cause a leak of gas to the room. In addition, I sought to gain the advantage—already possessed by the flash tube method—that the operation of lighting the ring should be only one movement and not two, as in my previous arrangement.

My device as it now stands is shown in fig. 2. (Patent applied for.) It consists in a small unit attached to the cooker tap, by which, when the latter is turned on, there is a momentary ray of burning gas which strikes across the hot-plate, lighting the burner.

When the cooker tap A is turned on gas issues from nipple B and passes to burner C. At the same time the oncoming gas operates the unit D, which is also shown in elevation in (b), (c) and (d). It consists in a cylindrical brass chamber, the top and bottom ends of the cylinder being machined as valve faces. Inside this brass tube is a brass piece

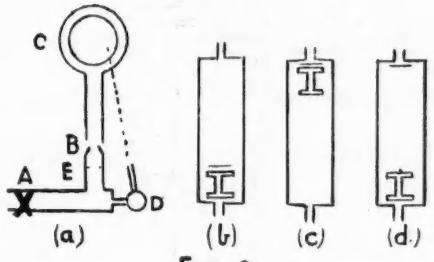


FIG 2

in form similar to two wheels on an axle, and on top of this rests a thin circular plate. When not in use the position is as in (b). When tap is turned on the "bobbin" and plate are blown up to the top (c); the bobbin immediately falls back (d), while the plate remains at the top. When gas is turned off plate falls back on to bobbin (b). For the short period while bobbin and plate are rising there is an " escape" of gas past them—hence the igniting ray, the escaping ray of gas passing a permanent pilot light.

It is necessary to have both the bobbin and the plate. Previously I had only one piece inside the brass tube, but the desirability of splitting it into two functions soon became apparent. If I have only the bobbin it certainly functions, but when the gas tap is restricted to a reduced gas flow, such as would keep a pan simmering, the reduced pressure allows the bobbin to fall and escape of gas past it takes place. If I had the thin plate alone it would not be successfully placed in the top position by turning on of gas, but bobbin and plate work together. It would be an advantage if any manufacturer taking up the device could supply a certain degree of restriction by an orifice at E; this would enable plate to remain in upper position at still lower pressure at burner.

My particular branch is in the chemical laboratory, and there are many operations there which are tedious—routine weighings, filtrations, titrations, calculation of results, &c., and this is the same whether we are in the Gas Industry or any other industry or in analytical practice. We are all analyzing something according to a precisely laid-down procedure in British standard specifications or in Government-published methods of analysis. To do this day after day requires no high level of brains or intelligence—there is nothing in it, and it can be mechanized or at least facilitated and speeded up.

In the following I propose methods for mechanizing the work of the laboratory and of the laboratory staff on the plant.

Recording Gas Calorimeter.

I had the pleasure of addressing you in 1934 on an original invention, "A New Recording Gas Calorimeter," and again in 1941 on "An Improved Recording Gas Calorimeter." The present time is not conducive to getting much instrument making work done, and so I have not been able to have my designs carried into effect as much as I would have liked. My calorimeter is, however, now under construction, and I hope to bring it forward to the notice of the Gas Industry shortly.

Novel Type of Chart for Recording Instruments.

In this (Patent applied for) I aim at combining the specific advantages of the disc type of chart and the tape chart in one. Those who have experience with recorder charts know that in general the disc type is to be preferred. That is why it is so much more largely adopted. Its zero is more reliable. Its manner of manipulation is more reliable—the tape type of chart is apt to come off its sprocket drive as well as jam in its guides. But the disc chart has one fault which is absolutely fatal to its use on recording calorimeters and some other instruments—it has to be changed by hand daily, whereas the tape chart runs through continuously. My solution is a special form of disc chart which changes itself automatically daily at any specified time—say 12 midnight. The chart is shown in fig. 3. It looks like the usual disc chart, with the exception that there is a deep roughly V-shaped piece cut out of it radially. Also immediately to the left of the cut-out V is a shaded area bounded by the curved line of 12 midnight. The curved line to the left of that is the 1 a.m. line. The other hour lines follow round in order as usual, but the 12 midnight line terminating the 24 hours is not, unlike all other disc charts, the same 12 midnight line as began the day. In this chart it is short of that position, being in fact the right-hand curved edge of the cut-away V. The cut-away V corresponds with one hour of the ordinary disc chart. The length of tracing which on an ordinary chart represents 23 hours on this chart represents 24 hours, and the spindle which drives this chart makes, not one revolution per 24 hours, but 23/24ths of a revolution.

When the operator attends to put on the charts he puts on a week's supply (or more) at once. He mounts upon a metal disc the eight (or more) charts and puts the disc upon the recording instrument.

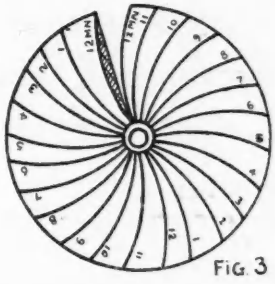


FIG. 3

As each successive midnight is reached the charts automatically fall off—one per day—and the pen is already recording on the one below.

To load the metal carrier-disc with charts the operator first dates them all. Then he puts the last one which is to be recorded upon first upon the metal disc. The one for the second last day is second on metal disc, and so on. Each successive chart as he loads them is placed so that the curved right-hand edge of the V is coincident with the curved edge of the shaded area of the one below. At the side of the charts opposite the V is a row of ten small holes. These are to accommodate a positioning pin on the metal disc. In the case of the bottom chart the pin is through its first hole, in the second chart the pin is through the second hole, and so on. The manifold of charts being in position (placed vertically) the pen records on the uppermost one until the V, by 12 midnight, has reached the top. The pen now falls on to the chart below and a knife blade, pressing against the paper, now finds itself getting under the advancing edge of the shaded area of the uppermost chart, which, screwing itself against the blade, gets pushed off the central spindle, which only projects one-eighth of an inch. The chart then falls forward and falls off the positioning pin at bottom as well.

Recording Thermometer. (Patent applied for.)

Industry needs the best tools that science can devise. There is no thermometer for all practical purposes equal to the mercury in glass thermometer, and if any other is used in industry it is not that it is better, but rather that it has not been possible to adapt the mercury in glass thermometer to the purpose. The usual industrial thermometer is mercury in steel operating a Bourdon gauge. This is not as accurate or reliable as the mercury in glass thermometer, and it requires periodical checking against the latter. The mercury bulb in the mercury in steel thermometer is necessarily large, and this makes for a certain degree of lag. If the thermometer is to be used for thermostatic control, the smaller bulb of the mercury in glass thermometer would give finer control. Glass also resists the action of corrosive liquids and vapours as steel bulbs do not.

For the purpose of designing my recording thermometer I have copied the thermometer-proper portion of it from my recording calorimeter, but the manner of operating it is different.

The wheel (A) (fig. 4), driven from any convenient light source of power, drives another wheel carrying a crank operating the rod (B), which is loose in its bearing on the crank. Rotation of the wheel causes B to rise and fall alternately. When B is being lowered the pawl (C) engages teeth of wheel (D) and rotates it, and therefore the attached wheel (E) which lowers the magnet (F) (fig. 5). When contact is made in the thermometer the small electro-magnet (H) is excited, and the armature (K) being of a piece with the pawl, the latter is withdrawn from contact with the teeth of wheel D. At the same moment the circuit is broken by the mercury enclosed switch (L), which is mounted upon axle of armature-pawl. The armature is held in contact with the magnet, the surfaces being iron to iron, and so continued descent of the lever B does not result in wheel D being rotated. Finally a short piece of flange forming a short arc of a circle mounted on wheel (M) comes upon flange of wheel (N), and rotates the latter (and therefore D and E) backwards. Thus magnet F is raised, contact in thermometer is broken, and the raising of lever B results in the metal strip P coming against the stop pin (Q), removing armature from magnet. As the upstroke of B continues the pawl slips over the teeth of wheel D until top of stroke is reached and cycle recommences.

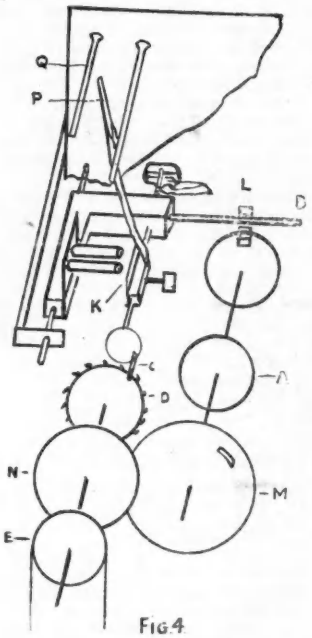


FIG.4

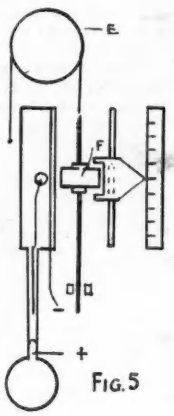


FIG.5

The V-arms embracing magnet allow of its small up and down motion at each cycle without passing it on to the reading. Only when a change of temperature occurs does the magnet movement affect the indicator or pen.

Recording Hygrometer. (Patent applied for.)

The hygrometer, whether recording or non-recording, has in recent years become an important instrument in chemical industry. It is useful to our own Industry among the others, especially in the case of those undertakings which practise gas drying.

The best practical instrument for the purpose is the dry and wet bulb hygrometer. This is an instrument which has to be used by an operator. He reads the dry bulb thermometer and notes the depression of the wet bulb. Then he looks up a table showing vertically the dry bulb readings and horizontally the depression of the wet bulb. In this way he finds a figure representing the percentage saturation. Allen's *Chemical Engineering* shows a diagram of a recording hygrometer of this type—there are two graphs, a dry bulb reading and a wet bulb reading—made simultaneously on the same chart, the one above the other. From these two records it is possible to work out by reference to the above-mentioned table the relative humidity at any particular time. The "bulbs" were bi-metallic temperature elements—one of them kept wet. Most users, however, do not want two records from which the result can be obtained. They want one recorded result showing directly the relative humidity. This opens up the way for less reliable instruments, but which have the advantage of giving one figure somewhere near the correct result. Thus we have the hair hygrometer in which use is made of the alterations in length occurring in specially treated hairs as the humidity changes. A disadvantage of the hair hygrometer also is the fact that the scale gradually closes.

In designing this recording hygrometer I have kept in mind these propositions:

(1) The best practical hygrometer is the dry and wet bulb type.

(2) The best type of "bulb" is the mercury in glass thermometer.

(3) The result should be apparent as one reading.

(4) The scale should be equally open over the range of readings.

The actual dry and wet bulb thermometers are identical with that described under "Recording Thermometer," but the manner of using them is adapted to the unique requirements of this instrument.

An F-shaped frame (F) (fig. 6) carries the axles of two sprocket-wheels (A) and (B), from which are suspended by rods, (C) and (D), two soft iron strips, (E) and (G). Mounted on them are two magnets, (H) and (K), which operate the thermometers in the usual way. In close proximity to E and G are two electromagnets so situated as to magnetically "bite" the soft iron strips at the making of dry and wet bulb contacts respectively.

The action is as follows : The frame F is slowly lowered by any convenient source of light power, wheels A and B descending with it and therefore also strips E and G, carrying permanent magnets H and

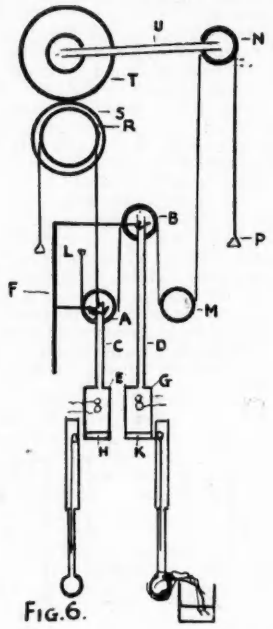
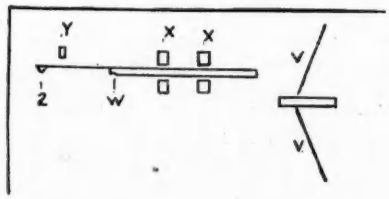


FIG.6.



K. When dry bulb contact is made a circuit is completed which excites electromagnet, arresting any further descent of strip E. The frame, F, continues to descend, leaving wheel A behind, and wheel B continues to descend until wet bulb contact is made. When this occurs its descent is also arrested, while F continues to bottom of its stroke.

There is a chain, fastened at point L, passing under sprocket wheel A, over B, under M, and over N. As long as wheels A and B are both descending, since B gives out the same length of chain as A absorbs, there is no rotation of wheels N and M. But when A has ceased to descend, the descent of B rotates M and N. The small weight (P) serves to keep chain taut.

Now, as long as wheel A is descending, the chain attached to top end of rod C causes rotation of sprocket wheel (R), which rotates its coaxial wheel (S). This by friction rotates wheel (T). It is therefore obvious that the angle through which T is turned depends entirely on the dry bulb reading. Once descent of A is arrested, wheel N rotates, lifting the rod (U), which is rigidly secured to the wheel and which carries the axle of wheel T. Wheel T is therefore lifted in a circular path (centred at N), an amount dependent on, not the bulb reading, but the *depression* of the wet bulb, below the reading of the dry bulb.

We have thus got the result that wheel T has been *rotated* through an angle dependent on the *dry bulb reading* and *moved radially* an amount dependent on the *depression of the wet bulb.*

To understand the use made of this effect to record the final result of relative humidity, it is necessary to digress a little.

(*To be continued*)

HIGH BEAM AND THERMO XX GAS FIRE RADIANTS

GAS fire radiants require a checkover at this time of year, in preparation for the colder weather.

Under present emergency conditions fitters may not be available for such work. Replacement radiants can, however, be quite easily put into place by the consumer who would obtain them from the Gas Showrooms.

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GAS PRODUCTS PRICES—STOCKS AND SHARES

The London Market Dec. 18.

There are no changes to report in the prices of Coal Tar Products.

A Government Order came into effect on March 1 controlling the price of Benzole and Coal Spirit and replacing the Control of Coal Tar Naphtha and Xylole Order, 1943.

The Order is known as the Control of Benzole and Coal Spirit Order, 1944 (S.R. & O. 1944, No. 172).*

By this Order the price of Motor Benzole is fixed at 2s. per gallon. The Order also lays down the method of evaluating Crude Benzole.

The Order also calls for periodical returns to the Ministry of Fuel and Power from all producers of Crude and Refined Benzole.

In connexion with the Coal Tar products market, the Government Order designated the Contol of Toluene (No. 4) Order, 1944 (S. R. & O. 1944, No. 170), contains an amendment of the Control of Toluene (No. 3) Order, 1943.

Attention is called to a new Government Order, which amends the price of Toluene as from Sept. 1, 1944. The Order is entitled, The Control of Benzole and Coal Spirit (No. 2) Order, 1944 (S. R. & O., No. 988).

The only change in connexion with the prices of Coal Tar Products refers to Naphthalene. A new Government Order, entitled the Coal Tar Products Prices (No. 2) Order, 1944 (S. R. & O. 1944, No. 1051), allows increases in the maximum prices for all forms of Naphthalene. The new Order came into force on Sept. 22, 1944.

* Slightly amended by Control of Benzole and Coal Spirit (No. 2) Order, 1944, which amendments came into force on Oct. 1.

The Provinces Dec. 18.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 2s. to 2s. 2½d., pure, 2s. 9d. (now controlled by S. R. & O. 1944, No. 988, operative from Sept. 1, 1944. Benzole and Coal Spirit, also Coal Tar Naphtha and Xylole, are now controlled by the Control of Benzole and Coal Spirit Order, 1944, dated Feb. 18, 1944, S. R. & O. 1944, No. 172, operative from March 1, and S. R. & O. 1944, No. 988, part 1, operative from Oct. 1, 1944. Carbolic acid, 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil controlled by the Coal Tar Products Prices Order, 1943, dated Oct. 20, 1943 (S. R. & O. 1943, No. 1528), operative from Nov. 15, 1943. Naphthalene now controlled under S. R. & O. 1944, No. 1051, operative from Sept. 22, 1944.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Scotland Dec. 16.

Market continues active, although export business is still difficult. Refined tar*: Yield to distillers is 4½d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6½d.; hydrogenation oil,* 5⅜d.; low gravity or virgin oil,† 7¼d. to 7½d.; benzole absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha,† 6½d to 7d. per gallon. Solvent naphtha*: Basic prices delivered in bulk, 90/160 grade, 2s. 8d., and 90/190 Heavy naphtha, Unrectified, 1s. 10½d.; Rectified, 2s. 2d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

There was no increase in the volume of business in the Stock Markets last week, the tone remaining rather subdued, while price movements were narrow.

Gas stocks and shares also met with less support, although the few changes in price were mostly in an upward direction. A feature was the strength of the Colonial Gas Association shares, the 8% preference closing 3s. higher at 23s. Oriental stock made further progress with a gain of 3 points, but Primitiva Holdings reacted on the Buenos Aires expropriation statement. Newcastle units were a little harder on the Local Exchange.

The following price changes occurred during the week:

SUPPLEMENTARY LIST

Southampton 5 p.c. Red. Deb. (x.d.)	105—110	Dec. 11

PROVINCIAL EXCHANGE

Newcastle Units	26/—26/6	+–/3d.

OFFICIAL LIST.

Bournemouth 4 p.c. Deb. (x.d.) ...	100—105	Dec. 11
Colonial Gas Association Ord. ...	16/—18/–	+1/–
Ditto 8 p.c. Pref.	22/—24/–	+3/–
Commercial 3 p.c. Deb. (x.d.) ...	70—75	Dec. 11
Croydon 5 p.c. Deb.	123—128	+3
Oriental	145—150	+3
Plymouth and Stonehouse Ord. (x.d.)	112—117	Dec. 11
Primitiva Holdings Ord.	11/—13/–	–1/–
Ditto 6 p.c. Red. Cum. Pref. (x.d.)	97—102	Dec. 11
South Metropolitan Ord.	91—94	–1
Tottenham 4 p.c. Deb. (x.d.) ...	98—103	Dec. 11

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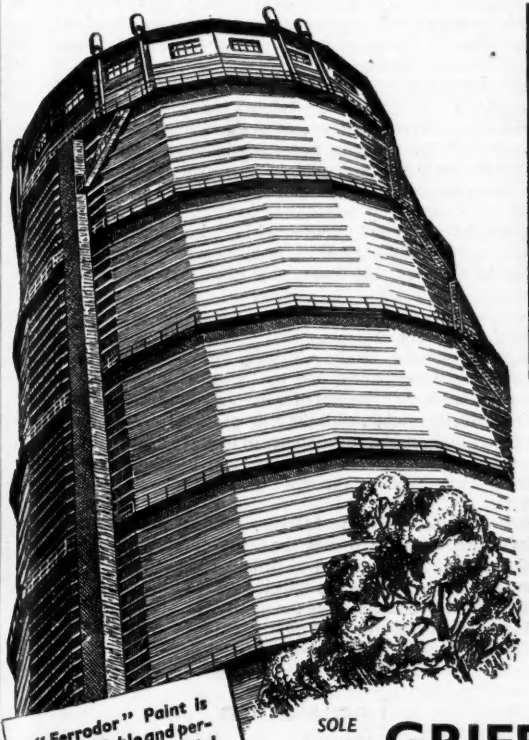

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